wherein,

P is a polymerizable moiety covalently attached to the permeation layer matrix and/or covalently attached to one or more other P-X-R groups, as defined herein, wherein the other P-X-R group may be the same as or different from the first P-X-R group;

X is a covalent bond or a linking moiety; and

R is a functional moiety for attaching, either covalently or non-covalently, a derivatized biomolecule, or for attaching covalently an other P-X-R group, as defined herein, wherein the other P-X-R group may be the same as or different from the first P-X-R group, and wherein R may, optionally, be attached to a biomolecule or an other P-X-R group.

2. The microarray of claim **1** wherein **P** is selected from the group consisting of, alkenyl, α,β,unsaturated carbonyl, vinyl, allyl and homoallyl moieties.

3. The microarray of claim **1** wherein **R** is selected from the group consisting of a covalent bond, streptavidin, a portion of streptavidin, biotin, phenyl boronic acid, salicylic hydroxamic acid, vinyl, allyl, homoallyl, acetal, ester, carboxylic acid, amide, halo-acetamide, thiol, phosphorothiolate monoester, thioester, disulfide, aldehyde, ketone, hydrazide, hydrazine, and amine moieties.

4. The microarray of claim **1** wherein **R** is a moiety that requires an activating step prior to participating in a chemical reaction for binding either a derivatized biomolecule or a moiety of an other P-X-R group.

5. The microarray of claim **4** wherein **R** requires activation by either basic or acidic conditions.

6. The microarray of claim **5** wherein the basic or acidic condition necessary to active **R** may be produced by applying an electronic potential at at least one electrode of the electronically addressable microarray.

7. The microarray of claim **1** wherein **P** is covalently attached to at least one other P-X-R group, further wherein the **P** is covalently attached to the **P** moiety of the at least one other P-X-R group.

8. The microarray of claim **7** wherein the at least one other P-X-R group is a portion of a polymer, wherein a backbone of the polymer comprises the **P** moieties of a plurality of P-X-R groups covalently attached to one another.

9. The microarray of claim **8** wherein the P and/or R moieties of the first P-X-R group and the P-X-R groups in the polymer backbone are the same.

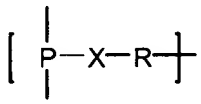
10. The microarray of claim **1** wherein **R** is covalently attached to an other P-X-R group, further wherein the **R** is covalently attached the **P** moiety of the other P-X-R group.

11. The microarray of claim **10** wherein the other P-X-R group is a portion of a polymer, wherein a backbone of the polymer comprises a plurality of P-X-R groups covalently attached to one another by P-R covalent attachments.

12. The microarray of claim **11** wherein the P and/or R moieties of the first P-X-R group and the P-X-R groups in the polymer backbone are the same.

13. The microarray of claim **1** wherein **X** is selected from the group consisting of a covalent bond, an alkyl group of 1-10 carbon atoms, an alkenyl group of 2-10 carbon atoms, alkyl esters, ketones , amides, ethers, thioesters, amido groups, and carbonyls, and any combinations thereof.

14. An electronically addressable microchip device comprising a plurality of electronically programmable microlocations, wherein the microlocations each comprise an underlying working microelectrode on a substrate, wherein at least some of the microelectrodes are covered by a permeation layer comprising first and second chemical groups having the formula



wherein,

P is a polymerizable moiety,

X is a linking moiety selected from the group consisting of a covalent bond, an alkyl group of 1-10 carbon atoms, an alkenyl group of 2-10 carbon atoms, alkyl esters, ketones, ethers amides, thioesters, amido groups, and carbonyls, and any combinations thereof; and

R is a functional moiety for attaching, either covalently or non-covalently, a derivatized biomolecule;

wherein the first and second P-X-R groups may be the same or different;

wherein the **P** moieties of the first P-X-R group are covalently attached to the permation layer matrix and to at least one **P** of the second P-X-R groups;

and wherein the **P** moieties of the second P-X-R groups are covalently attached to at least one other **P** moiety of another second P-X-R groups to form a polymer of the second P-X-R groups.

15. The microarray of claim **14** wherein **R** for the first and second P-X-R groups are, independently, selected from the group consisting of streptavidin, a portion of streptavidin, biotin, phenyl boronic acid, salicylic hydroxamic acid, vinyl, allyl, homoallyl, acetal, ester, carboxylic acid, amide, halo-acetamide, thiol, phosphorothiolate monoester, thioester, disulfide, aldehyde, ketone, hydrazide, hydrazine, and amines.

16. The microarray of claim **15** wherein **R** are the same for the first and second P-X-R groups.

17. The microarray of claim **14** wherein **P** of the first and/or second P-X-R groups require activation prior to participating in a polymerization reaction, wherein the activation is either under the same or mutually exclusive conditions.

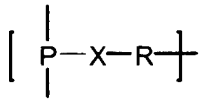
18. The microarray of claim **17** wherein the activation is by basic or acidic conditions.

19. The microarray of claim **18** wherein the basic or acidic conditions required for activation may be produced by applying an electronic potential at at least one electrode of the electronically addressable microarray.

B1 SUB C8

21. An electronically addressable microchip device comprising a plurality of electronically programmable microlocations, wherein the microlocations each comprise an underlying working microelectrode on a substrate, wherein at least some of the microelectrodes are covered by a permeation layer comprising first P-X-R groups and second P-X-R groups having the formula:

B2 SUB C3



wherein,

P is a polymerizable moiety,

X is a linking moiety selected from the group consisting of a covalent bond, an alkyl group of 1-10 carbon atoms, an alkenyl group of 2-10 carbon atoms, alkyl esters, ketones, ethers amides, thioesters, amido groups, and carbonyls, and any combinations thereof; and

R is a functional moiety for attaching, either covalently or non-covalently, a derivatized biomolecule;

wherein the first and second P-X-R groups may be the same or different;
wherein the **P** of the first P-X-R group are covalently attached to the permeation layer matrix
wherein the **R** of the first P-X-R group is covalently attached to at least one **P** of the second P-X-R groups;
and wherein the **P** of the second P-X-R groups are covalently attached to at least one other **P** of another second P-X-R groups to form a polymer of the second P-X-R groups.

22. The microarray of claim **21** wherein **R** for the first and second P-X-R groups are, independently, selected from the group consisting of streptavidin, a portion of streptavidin, biotin, phenyl boronic acid, salicylic hydroxamic acid, vinyl, allyl, homoallyl, acetal, ester, carboxylic acid, amide, halo-acetamide, thiol, phosphorothiolate monoester, thioester, disulfide, aldehyde, ketone, hydrazide, hydrazine, and amines.

23. The microarray of claim **22** wherein **R** is the same for the first and second P-X -R groups.

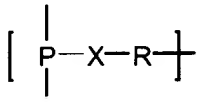
24. The microarray of claim **21** wherein the **P** or **R** of the first and/or second P-X-R groups require activation prior forming a covalent bond between the **P** and **R** of the first and second group, wherein the which activation is either under the same or mutually exclusive conditions.

25. The microarray of claim **24** wherein the activation is by basic or acidic conditions.

26. The microarray of claim **25** wherein the basic or acidic conditions required for activation may be produced by applying an electronic potential at at least one electrode of the electronically addressable microarray.

28. An electronically addressable microchip device comprising a plurality of electronically programmable microlocations, wherein the microlocations each comprise an underlying working microelectrode on a substrate, wherein at least some of the microelectrodes are

covered by a permeation layer comprising a first P-X-R group attached to biomolecules and/or to polymerized monomer units comprising second P-X-R groups, wherein the polymerized second P-X-R groups are further attached to biomolecules, wherein the attachment of the biomolecules to the first P-X-R groups or to the polymerized second P-X-R groups requires activation of at least one of the first and/or the second P-X-R groups under acidic and/or basic pH conditions, wherein the first and second P-X-R groups have the formula



wherein,

P is a polymerizable moiety,

X is a linking moieties selected from the group consisting of a covalent bond, an alkyl group of 1-10 carbon atoms, an alkenyl group of 2-10 carbon atoms, alkyl esters, ketones, ethers amides, thioesters, amido groups, and carbonyls, and any combinations thereof; and

R is a functional moiety for attaching, either covalently or non-covalently, a derivatized biomolecule or for attaching covalently an other P-X-R group;

wherein **P** comprises a chemical element requiring activation for attaching to the permeation layer and/or to a **P** of an other P-X-R group;

and wherein **R** comprises chemical elements requiring activation different from **P** of either the first or second P-X-R groups for attaching the biomolecules, or to **P** of another P-X-R groups.

29. The microarray of claim **28** wherein the permeation layer comprises a polymer polymerized from a monomer selected from the group consisting of acrylamide, bisacrylamide, methacrylamide, *N*-alkyl acrylamides, functionalized ethylene glycol derivatives, *N*-vinyl pyrrolidinone, bis-cystamine, acrylates, methacrylates, and acrylonitriles.

30. The microarray of claim **28** wherein the biomolecules are derivatized with a chemical moiety selected from the group consisting of vinyl, allyl, homoallyl, acetal, ester, carboxylic acid, amide, halo-acetamide, thiol, phosphorothiolate monoester, thioester, disulfide, aldehyde, ketone, hydrazide, hydrazine, and amines.

31. The microarray of claim **28** wherein **P** for the first and second P-X-R groups are, independently, selected from the group consisting of alkenyl moieties, α,β,unsaturated carbonyls, vinyl, allyl and homoallyl groups, acetal, thioester, disulfide, epoxides, alkyl ether, and carboxylic acid moieties.

32. The microarray of claim **28** wherein the **X** for the first and second P-X-R groups are, independently, selected from the group consisting of a covalent bond, a carbon chain consisting of 1 to 10 carbons, ethers, polyethers, amides, and esters.

33. The microarray of claim **28** wherein the **R** for the first and second P-X-R groups are, independently, selected from the group consisting of alkenyl moieties, α,β,unsaturated carbonyls, vinyl, allyl, homoallyl, acetal, ester, carboxylic acid, thioester, disulfide, epoxide, and alkyl ether moieties.

34. The microarray of claim **33** wherein the **R** is the same for the first and second P-X-R groups.

35. The microarray of claim **28** wherein the acidic or basic conditions are produced by a method selected from the group consisting of: contacting the electronic microarray with a buffer of the appropriate pH, applying an electronic potential at at least one electrode of the electronically addressable microarray to alter the pH, and a combination of the two methods.

36. The microarray of claim **28** wherein **R** for the first and second P-X-R groups are thioester moieties.

37. The microarray of claim **28** wherein ℝ for the first and second P-X-R groups are acetal moieties.

38. The microarray of claim **28** wherein the ℝ is selected from the group consisting of derivatized amine, salicyl hydroxamic acid, bromoacetamide, salicyl hydroxamic acid, maleimide, streptavidin, biotin, vinyl, allyl, homoallyl, acetal, ester, carboxylic acid, amide, halo-acetamide, thiol, phosphorothiolate monoester, thioester, disulfide, aldehyde, ketone, hydrazide, hydrazine, and amine moieties.

39. The microarray of claim **35** wherein the electronic potential used to alter the pH is applied at a current density of between 50 nA/5000μm^2 and 5 μA/5000μm^2 at the at least one electrode for a time period between 30 and 600 seconds.

Please add new claims 67-89:

67. The microarray of claim **1** wherein ℙ is selected from the group consisting of an acetal, epoxide, ester, carboxylic acid, amide, halo-acetamide, thiol, phosphorothiolate monoester, thioester, disulfide, aldehyde, ketone, hydrazide, hydrazine, and amine moieties.

68. The microarray of claim **1** wherein ℝ is selected from the group consisting of streptavidin, a portion of streptavidin, and biotin.

69. The microarray of claim **1** wherein ℝ is selected from the group consisting of aldehyde, ketone, amine, hydrazine, hydrazide, haloacetamide, epoxide, thiol, phosphorothiolate monoester, and ester moieties.

70. The microarray of claim **1** wherein ℝ is selected from the group consisting of phenyl boronic acid and salicylic hydroxamic acid.

71. The microarray of claim **1** wherein ℝ is selected from the group consisting of disulfide, thioester, tertiary carbon, alkene, alkyl ether, acetal, and carboxylic acid.

72. The microarray of claim **14** wherein ℙ is selected from the group consisting of, alkenyl, α,β,unsaturated carbonyl, vinyl, allyl and homoallyl moieties.

73. The microarray of claim **14** wherein **P** is selected from the group consisting of an acetal, epoxide, ester, carboxylic acid, amide, halo-acetamide, thiol, phosphorothiolate monoester, thioester, disulfide, aldehyde, ketone, hydrazide, hydrazine, and amine moieties.

74. The microarray of claim **14** wherein **R** is selected from the group consisting of streptavidin, a portion of streptavidin, and biotin.

75. The microarray of claim **14** wherein **R** is selected from the group consisting of aldehyde, ketone, amine, hydrazine, hydrazide, haloacetamide, epoxide, thiol, phosphorothiolate monoester, and ester moieties.

76. The microarray of claim **14** wherein **R** is selected from the group consisting of phenyl boronic acid and salicylic hydroxamic acid.

77. The microarray of claim **14** wherein **R** is selected from the group consisting of disulfide, thioester, tertiary carbon, alkene, alkyl ether, acetal, and carboxylic acid.

78. The microarray of claim **14** wherein the **R** moieties of the first and/or second P-X-R groups require activation prior to covalent attachment to a biomolecule, wherein the activation is either under the same or mutually exclusive conditions for the first and second groups.

79. The microarray of claim **78** wherein the activation is by basic or acidic conditions.

80. The microarray of claim **79** wherein the basic or acidic conditions required for activation may be produced by applying an electronic potential at at least one electrode of the electronically addressable microarray.

81. The microarray of claim **21** wherein **P** is selected from the group consisting of, alkenyl, α,β,unsaturated carbonyl, vinyl, allyl and homoallyl moieties.

82. The microarray of claim **21** wherein **P** is selected from the group consisting of an acetal, epoxide, ester, carboxylic acid, amide, halo-acetamide, thiol, phosphorothiolate monoester, thioester, disulfide, aldehyde, ketone, hydrazide, hydrazine, and amine moieties.

83. The microarray of claim **21** wherein **R** is selected from the group consisting of streptavidin, a portion of streptavidin, and biotin.

84. The microarray of claim **21** wherein **R** is selected from the group consisting of aldehyde, ketone, amine, hydrazine, hydrazide, haloacetamide, epoxide, thiol, phosphorothiolate monoester, and ester moieties.

85. The microarray of claim **21** wherein **R** is selected from the group consisting of phenyl boronic acid and salicylic hydroxamic acid.

86. The microarray of claim **21** wherein **R** is selected from the group consisting of disulfide, thioester, tertiary carbon, alkene, alkyl ether, acetal, and carboxylic acid.

87. The microarray of claim **1** wherein the permeation layer comprises a polymer polymerized from a monomer selected from the group consisting of acrylamide, bisacrylamide, methacrylamide, *N*-alkyl acrylamides, functionalized ethylene glycol derivatives, *N*-vinyl pyrrolidinone, bis-cystamine, acrylates, methacrylates, and acrylonitriles.

88. The microarray of claim **14** wherein the permeation layer comprises a polymer polymerized from a monomer selected from the group consisting of acrylamide, bisacrylamide, methacrylamide, *N*-alkyl acrylamides, functionalized ethylene glycol derivatives, *N*-vinyl pyrrolidinone, bis-cystamine, acrylates, methacrylates, and acrylonitriles.

89. The microarray of claim **21** wherein the permeation layer comprises a polymer polymerized from a monomer selected from the group consisting of acrylamide, bisacrylamide, methacrylamide, *N*-alkyl acrylamides, functionalized ethylene glycol derivatives, *N*-vinyl pyrrolidinone, bis-cystamine, acrylates, methacrylates, and acrylonitriles.

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REMARKS

Applicant has submitted replacement claims 1-19, 21-26, 28-39, and new claims 67-89 (above) and a marked-up copy of the old claims (attached) as required by the new PTO rules. If the Examiner has any questions regarding the amendments, he is invited to contact the undersigned at (949)567-2305.